

Title: Putting Your Money to Work

Brief Overview:

This unit will introduce the student to computational science using a spreadsheet as a tool. The students will enter data and formulas in a spreadsheet, create graphical representations of the data, and solve real-world situations involving compound interest.

Links to NCTM Standards:

- **Mathematics as Problem Solving**

Students will demonstrate the ability to use problem-solving approaches to investigate and apply patterns, graphs, and functional relationships as they relate to financial issues.

- **Mathematics as Communication**

Students will use spreadsheets and graphs to communicate mathematical ideas and draw conclusions based on data analysis. Students will use written responses to activities and performance assessments to reflect and clarify what they have learned about compound interest problems.

- **Mathematics as Reasoning**

Students will reinforce logical reasoning skills by comparing the results of investments and payments at differing interest rates, compounding rates, and periods of time.

- **Mathematical Connections**

Students will investigate the connections between growth functions and real-world situations. Students will determine inter-relationships amongst principal, interest rates, and time.

- **Algebra**

Students will learn to operate on expressions and solve equations. Students also will use graphs and tables as tools to interpret and solve growth problems.

- **Functions**

Students will represent and analyze relationships using tables and graphs. Students will recognize that a variety of problem situations can be modeled by the same type of function. Students will analyze the effects of parameter changes on the graphs of functions.

Links to Maryland High School Mathematics Core Learning Goals

- **1.1.1**

The student will recognize, describe, and extend patterns and functional relationships that are expressed numerically, algebraically, and geometrically.

- **1.1.2**

The student will represent patterns and functional relationships in a table, as a graph, and/or by mathematical expression.

- **1.1.3**

The student will add, subtract, multiply, and divide algebraic expressions.

- **1.1.4**

The student will describe the graph of a non-linear function and discuss its appearance in terms of the basic concepts of maxima and minima (highs and lows), roots (zeros), limits (boundaries), rate of change, and continuity.

- **1.2.5**

The student will apply formulas and use matrices to solve real-world problems.

Grade/Level:

Grades 9-12; Algebra I, Algebra II, Business Math

Duration/Length:

Two to three class periods (variable)

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Computer use
- Basic spreadsheet use
- Basic graphing skills
- Use of formulas

Objectives:

Students will be able to:

- enter data and formulas into a spreadsheet.
- create graphs from spreadsheet data.
- identify and analyze relationships using tables and graphs.
- communicate verbal rules of equations.
- create a model to demonstrate the relationships among principal, interest, time and total payment.
- distinguish between simple and compound interests.
- use a graph to explain the equation: $\text{TOTAL PAYMENT} = \text{PRINCIPAL} + \text{INTEREST}$.
- demonstrate, through a performance-based project, their mastery of spreadsheet manipulation, graphing, and drawing conclusions from tables and graphs.

Materials/Resources/Printed Materials:

- Computer workstation with spreadsheet software
- Formatted floppy disks
- Activity sheets
- Graph paper

Development/Procedures:

During this unit, students will learn about the power of compounded interest for investments and payments. Students will enter data and formulas into spreadsheets, create graphical representations of their data using spreadsheet tools, and interpret real-life situations using their tables and graphs.

In the first activity, students will be introduced to the basic vocabulary used in spreadsheets and in investment finance. The students will predict and test the effects of interest rates on an investment.

In the second activity, students will determine future value of their savings account based on monthly deposits and interest rate in their attempts to save for a car.

The performance assessment for this unit is a task that applies a real-world problem to assess student understanding. The students will build a spreadsheet model and apply what they have learned in order to evaluate payment options in making a large purchase.

Performance Assessment:

Included with this unit is a performance assessment that is comprised of a student activity sheet, a student response sheet, a scoring guide, and a teacher's guide.

Extension/Follow Up:

- Develop interest formulas using exponents.
- Use TI-83 to input and calculate the interest formula.
- Incorporate the concepts of compounding periods (quarterly, monthly, daily, etc.).
- Apply algorithms to other real-world situations (saving for retirement, determining population growth, etc.).
- Develop an algorithm to determine present value based on a predetermined future value (e.g., a \$1 million retirement fund is worth how much today?).
- Determine required monthly payment/deposit to reach a predetermined goal (e.g., what will the monthly payment be for a car loan?).

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Pre-Unit Homework Assignment

Can I Afford a Ferrari ?

You are in search of a car that you would like to buy for yourself. Use a newspaper advertisement or contact a car dealership to complete the following assignment:

1. What is the make, year, and model of the car that you would like to purchase?
2. What is the dealer's price for the car?
3. Estimate the additional costs associated with tax, title, and freight (if applicable) necessary to purchase your car. Add these costs to the dealer's price in order to obtain the total price of your car.
4. Since you will need a loan, what interest rate is available from the dealer or from a bank in order to finance your car?
5. What is length of time over which you are able to finance your purchase?
6. Write the name of the car dealership, contact person, and phone number from which you obtained your information or attach the newspaper advertisement from which you worked.

Lesson 1 - Drill
Watching Your Money Grow

Important Terms

Principal	Interest	Periods	Balance	Cell	Column	Row
Spreadsheet	=(equal sign)	Cell location	Formula	Loan	Deposit	Label

Match the terms with the statements below.

1. _____ A table of numbers that is used to perform calculations.
2. _____ The amount of money placed in a financial institution(bank).
3. _____ The amount of money borrowed or owed.
4. _____ The payment for the use of money, expressed as an annual percentage.
5. _____ One location on a spreadsheet.
6. _____ A vertical group of cells.
7. _____ A horizontal group of cells.
8. _____ The number of times that interest is calculated.
9. _____ Words that describe a column or value.
10. _____ A cell spot, designated by a letter and number.(e.g., B2)
11. _____ A mathematical equation created to solve a problem.
12. _____ Borrowing money that will be paid back in a specified period with interest added.
13. _____ The symbol required to enter a formula.
14. _____ The amount of money available for use.

Spreadsheet notes:

LESSON 1 ACTIVITY -- WATCHING YOUR MONEY GROW

Problem Description

You have just inherited \$1000.00 from your grandmother. Your parents say you must invest the full amount or they will invest it for you. After a period of investigation, you discover that you have three options for investing your money. Able Bank offers a passbook account at 6% annual interest. Better Bank offers a certificate of deposit at 8% annual interest. Crazy Brokers offers a mutual fund that has historically returned an average 12% per year.

Part 1 Estimation

1. Which of these investment options appears to offer the best return on your money? Why ?

2. If you were to invest your \$1000.00 for a period of 30 years, what do you predict your ending balance will be if you chose the:

a. 6% passbook account_____.

b. Certificate of deposit_____.

c. Mutual fund_____.

3. Compute the simple interest on your \$1000.00 investment after one year in your 6% passbook account._____.

What is the formula that you used to compute your interest?_____.

Describe the formula that you would need to compute your ending balance after 30 years for an account that has a 6% interest rate, compounded annually.
_____.

Part 2 Spreadsheet

4. At your computer, use the above formula to build a spreadsheet to represent your three investment options over a 30 year investment period.

The spreadsheet should include the following heading and information:

	A	B	C	D	E
1	Watching Your Money Grow				
2		Effects of Compounded Interest			
3					
4	Beginning	Balance	\$1,000.00	Dollars	
5					
6	Interest Rate	0.06	0.08	0.12	
7	Year				
8	0	\$1,000.00	\$1,000.00	\$1,000.00	
9	1	\$1,060.00	\$1,080.00	\$1,120.00	
10	2	\$1,123.60	\$1,166.40	\$1,254.40	
11	3	\$1,191.02	\$1,259.71	\$1,404.93	

5. What formula did you put in cell B9 that contain this value \$1,060.00?
 - A. algebraic formula (use variable names) _____
 - B. spreadsheet formula (use cell descriptors) _____
6. Create a graph to display the three investment options. Use graph paper.
Be sure to create an appropriate title, label the axes, and make a legend.
7. Looking at the curves on the graph, what do you observe about the three investment options?

8. Now that you have completed your spreadsheet on your investments, what are the ending balances for a 30 year period?
 - a. 6% passbook account _____
 - b. Certificate of deposit _____
 - c. Mutual fund _____
9. What conclusions can you make from your results? Explain why calculated numbers differed from your estimates in problem #2.

10. What interest rate would you need to become a millionaire after 30 years? (based on the single deposit of \$1000)?

Lesson 1 Homework -- Watching Your Money Grow

You have just completed a spreadsheet and graphing activity in which you investigated the effects of varying interest rates on an amount of money invested over a period of time. Use your spreadsheet results to answer the following questions:

1. Approximately how long will it take for you to double your money if you invest it in an account with an interest rate of:

6% : _____ years
8% : _____ years
12% : _____ years
2. What conclusion can you make about the relationship between the amount of time it takes to double your money and the interest rate?
3. State a “rule of thumb” in general terms that might be applied to any investment about how long it will take to double your money.
4. At 12% interest, how long will it take to double your money? _____
How long will it take to double your money again? _____
How long will it take to double your money a third time? _____
5. What general conclusion can you make regarding the length of time it takes each time you are doubling your money?
6. How are the results above reflected in the graphs you made? How can you use this information to explain “the power of compound interest?”

LESSON 2 ACTIVITY -- WORKING FOR WHEELS

Problem Description

You are getting the itch to buy a car.

- Your friends are getting cars.
- Mom and Dad are just not taking you where and when you want to go.
- Not having a car is limiting your dating and socializing.

However, even after investing your grandmother's inheritance for years, you still do not have enough money. You are not going to get any money from your parents, so you have decided to take matters into your own hands. For the next two years, you have decided to deposit some of your earnings from your job each month. (The amount deposited each month will be equal in value.) With compounding interest, you think this will give you enough in your savings account to buy your first car.

The question is - "how soon will you be able to buy a car?"

Task

1. Develop a spreadsheet that will calculate the ending balance in your savings account for each month. This will let you see if your account is growing as you expect. Create the following variables in your spreadsheet:
 - **Interest Rate** (determined by the best rate you can get from a bank or another institution)
 - **Beginning Balance** (based on your previous success in investing your grandmother's inheritance)
 - **Monthly Deposit** (you plan to save \$100 per month, but you may choose to save more or less)

Before you start to build your spreadsheet, you will need to determine how the process you used in Lesson 1 Activity must be modified to account for a monthly deposit. (Refer to Question 1 below.)

2. Create a graph showing:
 - The growth of your savings account over time
 - The curve that indicates a running total of your monthly deposits
3. Obtain the teacher's approval on your spreadsheet and graph before proceeding with the questions on the next page.

Save your spreadsheet and graph.

Questions

1. Write the algorithm to calculate the ending balance of a savings account that has monthly deposits over a period of time. _____

2. Based on adding monthly deposits (over a two year period) into your savings account containing your grandmother's inheritance, answer the following:
 - a. What is the value of the savings account at the end of two years? _____
 - b. How much interest did your account earn? _____
 - c. Including the value of the inheritance, how much was deposited? _____
3. Relative to the curve representing your account balance at the end of each month, answer the following:
 - a. Describe the shape of the curve . _____
 - b. Why is the curve this shape? _____

 - c. How can you make it curve up faster? _____
4. Relative to the curve representing the running total of the monthly deposits, answer the following:
 - a. Describe the shape of the curve. _____
 - b. Why is the curve this shape? _____

 - c. How can you change the steepness of the curve? _____
5.
 - a. Enter the price of the vehicle you are planning to purchase. _____
 - b. Enter the value of your savings account after two years. _____
 - c. Enter account's surplus / deficit (difference between a & b). _____

6. a. Based on your account's surplus / deficit, what are your plans?

___ Buy the car

___ Buy a more expensive car -- price of car _____

___ Buy a cheaper car -- price of car _____

b. Do you need to get a loan? ___ yes ___ no If yes, specify loan amount. _____

7. a. Calculate the effective Annual Percentage Rate (APR). Hint: deposit 100 dollars and apply the monthly equivalent interest rate to the month ending balance to see what you end up with after one year.

b. Why is this different from the annual interest rate you used? _____

8. Attach a printout of your spreadsheet -- one page showing the table with dollars and another sheet showing the formulas in each table cell. Ensure the information is neatly displayed and it is understandable.

9. Attach a printout of your graph to this sheet. Be sure the graph has appropriate title, legend, and labels. Ensure the information is neatly displayed and it is understandable.

PERFORMANCE ASSESSMENT TASK

Can I Afford A Ferrari?

Instructions

You will create a spreadsheet that calculates car payments based on variable inputs of: amount of the loan, interest rate and desired monthly payment. You will use the spreadsheet to answer questions and determine the affordability of buying various types of cars.

1. Open a new spreadsheet file called *analyzeloan*.
2. Enter labels in column A for : CAR LOAN, INTEREST RATE and MONTHLY PAYMENT. Enter the data values for **car loan** = \$10,000, **interest rate** = 12% and **monthly payment** = \$250.
3. Enter labels in row 5 for MONTH, BALANCE, TOTAL PRINCIPAL, TOTAL PAYMENT, TOTAL INTEREST, INTEREST, PRINCIPAL AND NEW BALANCE.
4. Number the **Month** column from one to 48.
5. Enter a function that places the car loan amount in the cell under the **Balance** label.
6. Enter a formula that calculates the **Total Principal** paid to date.
7. Enter a formula that calculates the **total payments** to date.
8. Enter a formula that calculates **Total Interest** to date.
9. Enter a formula that calculates the **Current Interest** payment.
10. Enter a formula for the **Current Principle** payment.
11. Enter a formula that calculates the new **Loan Balance**.
12. From month two under **New Loan Balance**, copy the formula through month 48.
13. Enter a formula that sums the **Total Principal**, and copy the formula through month 48.
14. Enter a formula that sums **Total Payments**, and copy through month 48.
15. Enter a formula sums **Total Interest**, and copy through month 48.
16. Enter a formula to calculate **Current Interest**, and copy through month 48.
17. Enter a formula to calculate **Total Principle**, and copy through month 48.
18. Format the cells to show dollar signs and two decimal places.
19. Format the loan percentage cell to show a percentage sign.
20. Create a line chart using: **Interest** and **Principle**. Provide an appropriate title and legend.
21. Create a line chart using : **Total Interest, Interest, Principal, and New Balance**. Provide an appropriate title and legend for the graph. Label the axes.

PERFORMANCE ASSESSMENT TASK

Can I Afford A Ferrari?

Problem Description

You have had money in the bank since you inherited \$1000 from your grandmother many years ago. You have been saving money from your part time job for the past several years. You have saved enough money to buy a used station wagon with fake woodgrain sides. However, you would like to buy a car that better fits your style. The problem is that you still do not have enough money to buy the car that you want. So you decide to follow the *American dream* the *American way* and take out a loan.

You will create a spreadsheet that calculates car payments based on variable inputs of: **loan amount**, **interest rate**, and desired **monthly payment**. You will use the spreadsheet to answer questions and determine the affordability of buying various types of cars, including your dream car.

Task

Create a spreadsheet for 48 months that calculates the affordability of taking out various loan amounts. In addition, create a graph from the spreadsheet for data interpretation. See the performance assessment instruction sheet. Start with a loan of \$10,000 for 48 months at 12% interest, with a \$250 monthly payment.

Questions

1. At the end of 48 months, what is the balance of the \$10,000 loan?
2. Will you be able to buy the car in 48 months at the current level of monthly payments?
Continue to change the monthly payment amount to determine what the monthly payments would need to be in order for the balance to be 0 at the end of 48 months?
3. Name three changes that you could make in order to be able to pay off the loan.
 - a. _____
 - b. _____
 - c. _____
4. What is the maximum amount that you could borrow at 12% with a \$250 monthly payment and pay off in 48 months?
5. What would the interest rate have to be to pay off a \$10,000 loan with \$250 monthly payments?
6. Graph the interest and principal amounts vs. time. Explain the relationship over time.
7. Using the graph, how would you interpret the relationship between total principal, total interest and total payment? In what month will the loan be 50% paid off?

Extension

Determine the set of conditions (payment, interest rate and principal) under which you can purchase the car that you selected in your homework assignment.

Putting Your Money to Work

Written Performance Assessment

You have completed several activities in which you have built spreadsheets and used graphs to analyze the effects of investing money. In this assessment, you will recall some of the information that you have learned and apply that knowledge to build a spreadsheet and graph to analyze payments for a purchase.

1. Explain the difference between a relative and an absolute reference.

2. What is an algorithm?

3. What makes this model different from a calculation?

4. Define the following terms as they apply to an investment or a loan:
 - a. Principle _____
 - b. Investment Period _____
 - c. Loan Payment Period _____
 - d. Interest Rate _____
 - e. Total Value of Investment _____
 - f. Total Loan Payment _____

5. Complete the word equation:
$$\text{Total Value of Investment} = \text{_____} + (\text{_____} * \text{_____})$$

6. Complete the word equation:
$$\text{Total Loan Payment} = \text{_____} + \text{_____}$$

7. You recently bought a stereo system and still owe \$1,200 on the outstanding loan. Yesterday, you won \$2,000 in a science fair contest. You have the option to payoff all, some or none of your loan balance. You have chosen to invest the amount not applied to the loan. Given what you have learned through your spreadsheet analyses, explain what you would choose to do with your money and why.

Putting Your Money to Work Teacher's Guide

Introduction

This unit is designed for students at a variety of ability levels through Algebra II. It uses computational science to develop the concept of compounding as it applies to investment and loan interest. Using a series of successive sums on a spreadsheet, students will be able to visualize through graphs and draw conclusions about the effects of compounding. This unit is designed to introduce the concept of exponential functions WITHOUT explicitly using formulas involving exponents.

Objectives Covered

This unit covers all of the objectives described on the overview pages. The culminating performance task is specifically designed to achieve the following objective:

Students will be able to demonstrate, through a performance-based project, their mastery of spreadsheet manipulation, graphic visualization and drawing conclusions.

Tools/Materials Needed for Assessment

This unit has been prepared with the assumption that individual students will each have access to computer workstations with appropriate spreadsheet software. Minimal modifications are required for group activities. Although the teacher's guide has been prepared using the Microsoft Works 4.0 suite, other spreadsheet packages such as ClarisWorks, Microsoft Office (Excel) or Lotus 1-2-3 are easily accommodated.

Student Preparation

It is assumed throughout this unit that students are proficient in the mechanics of spreadsheets. This means that students can enter text, data and formulas into cells; make absolute and relative cell references; format cell data; and copy, fill and move information. This unit has been prepared for a 3 to 5 day period, depending on the students' proficiency level. The teacher should lead students in populating the spreadsheet and creating well presented graph to the degree necessary to have students draw conclusions about investment growth and loan payments. The teacher may also need to introduce or refresh students on basic financial formulas used in the spreadsheet.

Pre-Unit Assignment

Homework - Can I Afford a Ferrari?

This homework assignment requires students to contact a local car dealership or to reference a newspaper ad so as to have individual information for use in Activity 2 and the Performance Assessment. The homework must be completed prior to the culminating performance activity.

Lesson 1 - Watching Your Money Grow

Drill/Warm Up

This drill is designed to review basic terminology used in spreadsheets and finance. If students are unfamiliar with the concepts presented, the teacher should consider appropriate instruction before continuing.

Activity

This activity introduces the students to the concept of compounding interest by doing successive additions. Students should be challenged to predict the effects of investing money at different interest rates over a 30 year period. It is anticipated that they will be surprised to discover that their money grows much more rapidly at 12% than at 6%. The important formula for the students to use is:

$$\text{NEW BALANCE} = \text{BEGINNING BALANCE} + (\text{BEGINNING BALANCE} * \text{INTEREST RATE})$$

The activity sheet allows students to practice skills in basic spreadsheet manipulation. Teachers will have to demonstrate computer skills either before students build their own spreadsheet or as students work concurrently at their computers. The spreadsheet can be made into a dynamic, general use tool by referring to the cells for beginning balance and interest rates as absolute references in formulas. Students should ultimately be able to vary the interest rate and/or the beginning balance to “make a million bucks.”

Homework

In this homework assignment, students discover what it takes to “double their money.” The conclusion can be summarized as “the rule of 72”. This rule states that 72 divided by the interest rate gives the approximate number of years of investment required to double the investment.

Lesson 2 - Working for Wheels

Drill/Warm Up

The purpose of this drill is to reinforce the concepts of simple and compound interest. Students may use a calculator to perform this drill. Formulas involving exponents are not required.

DRILL

1. Calculate the value of your savings account based on the following information.

Beginning balance	\$10,000
Simple interest rate	5%
Period	2 years

2. Calculate the value of your savings account based on the following information.

Beginning balance	\$10,000
Annual interest rate	5%
Period	2 years

DRILL ANSWERS

1. $(\$10,000)(1 + .05) = \$10,500$ (Simple interest is computed only once in the period)
2. $(\$10,000)(1 + .05) = \$10,500$ (Compound interest is computed for each year)
 $(\$10,500)(1 + .05) = \$11,025$

Activity

This activity is designed to introduce the concept of monthly deposits and their effects on savings accounts with compound interest. Students will perform the activity as described on the handout. The spreadsheet should be created using absolute addresses in the cells for **Beginning Balance**, **Interest Rate**, and **Monthly Deposit** so that students can pose a variety of “what-if” questions to observe the effects of changing one or more of these three variables.

Homework

This homework assignment should be given at the end of Activity 2.

HOMEWORK

1. Develop a scenario involving an interest problem on a separate piece of paper. Be sure your problem defines:
 - Beginning balance
 - Interest rate and type (simple vs compound)
 - Period of time involved
 - Periodic deposits, if any.
2. Answer this problem on another sheet (becomes the answer key)
3. Be prepared to swap your problem with another classmate tomorrow. Therefore, your work must be neat and understandable.

HOMEWORK ANSWERS

Students answers will vary.

Performance Assessment - Can I Afford a Ferrari?

Performance Task

This task is the culmination of activities in this unit. The problem is an extension of the investment problems previously completed in that it involves loan payments. Step-by-step instructions for completing the spreadsheet inputs are provided and may optionally be used based on the proficiency of the students. Students will perform the activity as described on the handout. The spreadsheet should be created using absolute addresses in the formulas for the cells for **Beginning Balance**, **Interest Rate**, and **Monthly Deposit** so that students can pose a variety of “what-if” questions to observe the effects of changing one or more of these three variables.

Written Assessment

This part of the assessment requires students to perform basic recall, as well as to draw conclusions from the activities completed.

Scoring Tool

A generic rubric is included for scoring the spreadsheet and graphical portions of the performance assessment. The written assessment can be scored using a straight point-value approach. The teacher may also choose to evaluate students based upon observation as students are working with their spreadsheets and graphs.

Pre-Unit Homework Assignment

Can I Afford a Ferrari ?

You are in search of a car that you would like to buy for yourself. Use a newspaper advertisement or contact a car dealership to complete the following assignment:

1. What is the make, year, and model of the car that you would like to purchase?

ANS: WILL VARY

2. What is the dealer's price for the car?

ANS: WILL VARY

3. Estimate the additional costs associated with tax, title, and freight (if applicable) necessary to purchase your car. Add these costs to the dealer's price in order to obtain the total price of your car.

ANS: WILL VARY

4. Since you will need a loan, what interest rate is available from the dealer or from a bank in order to finance your car?

ANS: WILL VARY

5. What is length of time over which you are able to finance your purchase?

ANS: WILL VARY

6. Write the name of the car dealership, contact person, and phone number from which you obtained your information or attach the newspaper advertisement from which you worked.

ANS: WILL VARY

Lesson 1 - Drill

Watching Your Money Grow

Important Terms

Principal	Interest	Periods	Balance	Cell	Column	Row
Spreadsheet	=(equal sign)	Cell location	Formula	Loan	Deposit	Label

Match the terms with the statements below.

1. **SPREADSHEET** A table of numbers that is used to perform calculations.
2. **DEPOSIT** The amount of money placed in a financial institution(bank).
3. **PRINCIPAL** The amount of money borrowed or owed.
4. **INTEREST** The payment for the use of money, expressed as an annual percentage.
5. **CELL** One location on a spreadsheet.
6. **COLUMN** A vertical group of cells.
7. **ROW** A horizontal group of cells.
8. **PERIOD** The number of times that interest is calculated.
9. **LABEL** Words that describe a column or value.
10. **CELL LOCATION** A cell spot, designated by a letter and number.(e.g., B2)
11. **FORMULA** A mathematical equation created to solve a problem.
12. **LOAN** Borrowing money that will be paid back in a specified period with interest added.
13. **=** The symbol required to enter a formula.
14. **BALANCE** The amount of money available for use.

Spreadsheet notes:

LESSON 1 ACTIVITY -- WATCHING YOUR MONEY GROW

Problem Description

You have just inherited \$1000.00 from your grandmother. Your parents say you must invest the full amount or they will invest it for you. After a period of investigation, you discover that you have three options for investing your money. Able Bank offers a passbook account at 6% annual interest. Better Bank offers a certificate of deposit at 8% annual interest. Crazy Brokers offers a mutual fund that has historically returned an average 12% per year.

Part 1 Estimation

1. Which of these investment options appears to offer the best return on your money? Why ?
12%
2. If you were to invest your \$1000.00 for a period of 30 years, what do you predict your ending balance will be if you chose the:
 - a. 6% passbook account **Answers will vary. $(1000 + (1000 * 6\% * 30)) = 2,800$**
 - b. Certificate of deposit **Answers will vary. $(1000 + (1000 * 8\% * 30)) = 3,400$**
 - c. Mutual fund **Answers will vary. $(1000 + (1000 * 12\% * 30)) = 4,600$**
3. Compute the simple interest on your \$1000.00 investment after one year in your 6% passbook account. **\$60**

What is the formula that you used to compute your interest?

PRINCIPAL * INTEREST

Describe the formula that you would need to compute your ending balance after 30 years for an account that has a 6% interest rate, compounded annually. **Answers will vary.**

$(1000)(1 + .06)(1 + .06)(1 + .06) \dots 30 \text{ sets for 30 years}$

Part 2 Spreadsheet

4. At your computer, use the above formula to build a spreadsheet to represent your three investment options over a 30 year investment period.

The spreadsheet should include the following heading and information:

	A	B	C	D	E
1	Watching Your Money Grow				
2		Effects of	Compounded	Interest	
3					
4	Beginning	Balance	\$1,000.00	Dollars	
5					
6	Interest Rate	0.06	0.08	0.12	
7	Year				
8	0	\$1,000.00	\$1,000.00	\$1,000.00	
9	1	\$1,060.00	\$1,080.00	\$1,120.00	
10	2	\$1,123.60	\$1,166.40	\$1,254.40	
11	3	\$1,191.02	\$1,259.71	\$1,404.93	

5. What formula did you put in cell B9 that contain this value \$1,060.00?
 - A. algebraic formula (use variable names) Balance + Balance * Interest Rate
 - B. spreadsheet formula (use cell descriptors) = B8 + (B8 * \$B\$6)
6. Create a graph to display the three investment options. Use graph paper. Be sure to create an appropriate title, label the axes, and make a legend.
7. Looking at the curves on the graph, what do you observe about the three investment options?

The graph shows the higher the interest rate, the greater the increase and rate of increase.

8. Now that you have completed your spreadsheet on your investments, what are the ending balances for a 30 year period?
 - a. 6% passbook account \$5,743.49
 - b. Certificate of deposit \$10,062.66
 - c. Mutual fund \$29,959.82
9. What conclusions can you make from your results? Explain why calculated numbers differed from your estimates in problem #2.

When investing, you want to get the highest interest rate.

10. What interest rate would you need to become a millionaire after 30 years? (based on the single deposit of \$1000)?

Make it 26%

Watching Your Money Grow
Effects of Compounded Interest

Beginning Balance		\$1,000.00 Dollars		
Interest Rate	0.06	0.08	0.12	
Year				
0	\$1,000.00	\$1,000.00	\$1,000.00	
1	\$1,060.00	\$1,080.00	\$1,120.00	
2	\$1,123.60	\$1,166.40	\$1,254.40	
3	\$1,191.02	\$1,259.71	\$1,404.93	
4	\$1,262.48	\$1,360.49	\$1,573.52	
5	\$1,338.23	\$1,469.33	\$1,762.34	
6	\$1,418.52	\$1,586.87	\$1,973.82	
7	\$1,503.63	\$1,713.82	\$2,210.68	
8	\$1,593.85	\$1,850.93	\$2,475.96	
9	\$1,689.48	\$1,999.00	\$2,773.08	
10	\$1,790.85	\$2,158.92	\$3,105.85	
11	\$1,898.30	\$2,331.64	\$3,478.55	
12	\$2,012.20	\$2,518.17	\$3,895.98	
13	\$2,132.93	\$2,719.62	\$4,363.49	
14	\$2,260.90	\$2,937.19	\$4,887.11	
15	\$2,396.56	\$3,172.17	\$5,473.57	
16	\$2,540.35	\$3,425.94	\$6,130.39	
17	\$2,692.77	\$3,700.02	\$6,866.04	
18	\$2,854.34	\$3,996.02	\$7,689.97	
19	\$3,025.60	\$4,315.70	\$8,612.76	
20	\$3,207.14	\$4,660.96	\$9,646.29	
21	\$3,399.56	\$5,033.83	\$10,803.85	
22	\$3,603.54	\$5,436.54	\$12,100.31	
23	\$3,819.75	\$5,871.46	\$13,552.35	
24	\$4,048.93	\$6,341.18	\$15,178.63	
25	\$4,291.87	\$6,848.48	\$17,000.06	
26	\$4,549.38	\$7,396.35	\$19,040.07	
27	\$4,822.35	\$7,988.06	\$21,324.88	
28	\$5,111.69	\$8,627.11	\$23,883.87	
29	\$5,418.39	\$9,317.27	\$26,749.93	
30	\$5,743.49	\$10,062.66	\$29,959.92	

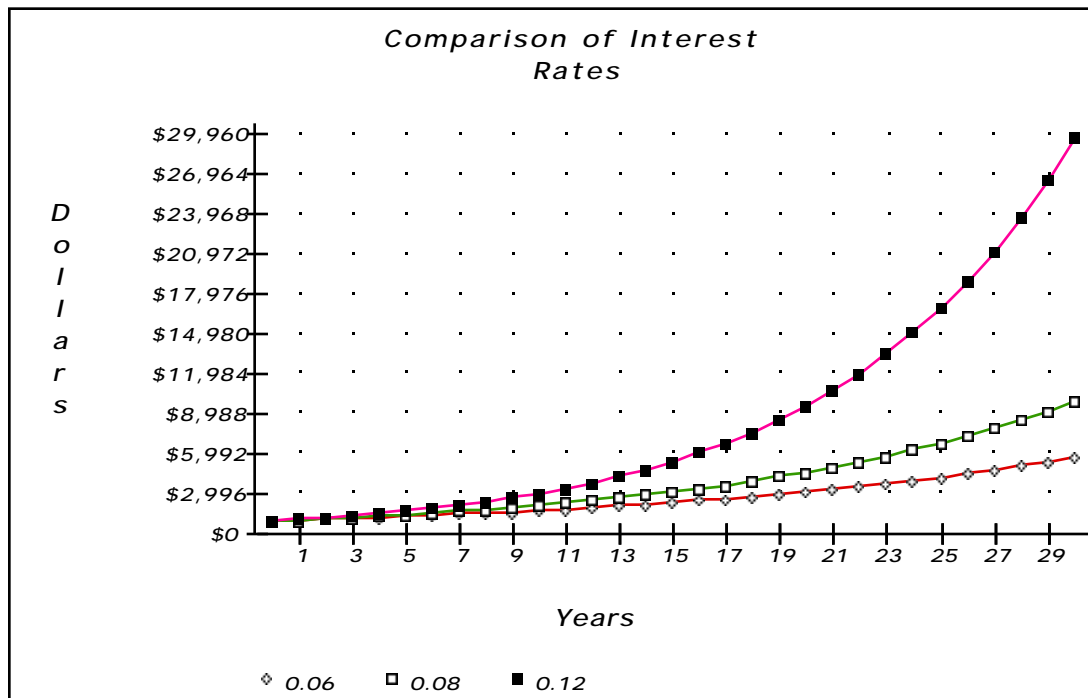
Watching Your Money Grow
Effects of Compounded Interest

Beginning Balance

1000 Dollars

Interest Rate	.06	.08	.12
Year			
0	1000	1000	1000
=A8+1	=B8+(B8*\$B\$6)	=C8+(C8*\$C\$6)	=D8+(D8*\$D\$6)
=A9+1	=B9+(B9*\$B\$6)	=C9+(C9*\$C\$6)	=D9+(D9*\$D\$6)
=A10+1	=B10+(B10*\$B\$6)	=C10+(C10*\$C\$6)	=D10+(D10*\$D\$6)
=A11+1	=B11+(B11*\$B\$6)	=C11+(C11*\$C\$6)	=D11+(D11*\$D\$6)
=A12+1	=B12+(B12*\$B\$6)	=C12+(C12*\$C\$6)	=D12+(D12*\$D\$6)
=A13+1	=B13+(B13*\$B\$6)	=C13+(C13*\$C\$6)	=D13+(D13*\$D\$6)
=A14+1	=B14+(B14*\$B\$6)	=C14+(C14*\$C\$6)	=D14+(D14*\$D\$6)
=A15+1	=B15+(B15*\$B\$6)	=C15+(C15*\$C\$6)	=D15+(D15*\$D\$6)
=A16+1	=B16+(B16*\$B\$6)	=C16+(C16*\$C\$6)	=D16+(D16*\$D\$6)
=A17+1	=B17+(B17*\$B\$6)	=C17+(C17*\$C\$6)	=D17+(D17*\$D\$6)
=A18+1	=B18+(B18*\$B\$6)	=C18+(C18*\$C\$6)	=D18+(D18*\$D\$6)
=A19+1	=B19+(B19*\$B\$6)	=C19+(C19*\$C\$6)	=D19+(D19*\$D\$6)
=A20+1	=B20+(B20*\$B\$6)	=C20+(C20*\$C\$6)	=D20+(D20*\$D\$6)
=A21+1	=B21+(B21*\$B\$6)	=C21+(C21*\$C\$6)	=D21+(D21*\$D\$6)
=A22+1	=B22+(B22*\$B\$6)	=C22+(C22*\$C\$6)	=D22+(D22*\$D\$6)
=A23+1	=B23+(B23*\$B\$6)	=C23+(C23*\$C\$6)	=D23+(D23*\$D\$6)
=A24+1	=B24+(B24*\$B\$6)	=C24+(C24*\$C\$6)	=D24+(D24*\$D\$6)
=A25+1	=B25+(B25*\$B\$6)	=C25+(C25*\$C\$6)	=D25+(D25*\$D\$6)
=A26+1	=B26+(B26*\$B\$6)	=C26+(C26*\$C\$6)	=D26+(D26*\$D\$6)
=A27+1	=B27+(B27*\$B\$6)	=C27+(C27*\$C\$6)	=D27+(D27*\$D\$6)
=A28+1	=B28+(B28*\$B\$6)	=C28+(C28*\$C\$6)	=D28+(D28*\$D\$6)
=A29+1	=B29+(B29*\$B\$6)	=C29+(C29*\$C\$6)	=D29+(D29*\$D\$6)
=A30+1	=B30+(B30*\$B\$6)	=C30+(C30*\$C\$6)	=D30+(D30*\$D\$6)
=A31+1	=B31+(B31*\$B\$6)	=C31+(C31*\$C\$6)	=D31+(D31*\$D\$6)
=A32+1	=B32+(B32*\$B\$6)	=C32+(C32*\$C\$6)	=D32+(D32*\$D\$6)
=A33+1	=B33+(B33*\$B\$6)	=C33+(C33*\$C\$6)	=D33+(D33*\$D\$6)
=A34+1	=B34+(B34*\$B\$6)	=C34+(C34*\$C\$6)	=D34+(D34*\$D\$6)
=A35+1	=B35+(B35*\$B\$6)	=C35+(C35*\$C\$6)	=D35+(D35*\$D\$6)
=A36+1	=B36+(B36*\$B\$6)	=C36+(C36*\$C\$6)	=D36+(D36*\$D\$6)
=A37+1	=B37+(B37*\$B\$6)	=C37+(C37*\$C\$6)	=D37+(D37*\$D\$6)

Watching Your Money Grow
Effects of Compounded Interest



Lesson 1 Homework -- Watching Your Money Grow

You have just completed a spreadsheet and graphing activity in which you investigated the effects of varying interest rates on an amount of money invested over a period of time. Use your spreadsheet results to answer the following questions:

1. Approximately how long will it take for you to double your money if you invest it in an account with an interest rate of:

6% : 12 years

8% : 9 years

12% : 6 years

2. What conclusion can you make about the relationship between the amount of time it takes to double your money and the interest rate?

INTEREST RATE * TIME = 72 FOR EXAMPLE: 6% X 12 YEARS = 72
8% X 9 YEARS = 72

3. State a “rule of thumb” in general terms that might be applied to any investment about how long it will take to double your money.

The length of time it takes to double your investment is equal to 72 divided by the interest rate.

4. At 12% interest, how long will it take to double your money? **6 YEARS**

How long will it take to double your money again? **12 YEARS**

How long will it take to double your money a third time? **18 YEARS**

5. What general conclusion can you make regarding the length of time it takes each time you are doubling your money?

It is the same length of time each time you double your money (e.g., you double each 6 years at 12%.

6. How are the results above reflected in the graphs you made? How can you use this information to explain “the power of compound interest?”

The graphs double in steepness each X number of years.

LESSON 2 ACTIVITY -- WORKING FOR WHEELS

Problem Description

You are getting the itch to buy a car.

- Your friends are getting cars.
- Mom and Dad are just not taking you where and when you want to go.
- Not having a car is limiting your dating and socializing.

However, even after investing your grandmother's inheritance for years, you still do not have enough money. You are not going to get any money from your parents, so you have decided to take matters into your own hands. For the next two years, you have decided to deposit some of your earnings from your job each month. (The amount deposited each month will be equal in value.) With compounding interest, you think this will give you enough in your savings account to buy your first car.

The question is - "how soon will you be able to buy a car?"

Task

1. Develop a spreadsheet that will calculate the ending balance in your savings account for each month. This will let you see if your account is growing as you expect. Create the following variables in your spreadsheet:
 - **Interest Rate** (determined by the best rate you can get from a bank or another institution)
 - **Beginning Balance** (based on your previous success in investing your grandmother's inheritance)
 - **Monthly Deposit** (you plan to save \$100 per month, but you may choose to save more or less)

Before you start to build your spreadsheet, you will need to determine how the process you used in Lesson 1 Activity must be modified to account for a monthly deposit. (Refer to Question 1 below.)

2. Create a graph showing:
 - The growth of your savings account over time
 - The curve that indicates a running total of your monthly deposits
3. Obtain the teacher's approval on your spreadsheet and graph before proceeding with the questions on the next page.

Save your spreadsheet and graph.

Questions

1. Write the algorithm to calculate the ending balance of a savings account that has monthly deposits over a period of time.

Take previous month ending balance and add the deposit. Calculate the interest (based on deposit on first day of month and interest is applied at end of month).

2. Based on adding monthly deposits (over a two year period) into your savings account containing your grandmother's inheritance, answer the following:
 - a. What is the value of the savings account at the end of two years? **\$3,734.03**
(Based on \$100/month)
 - b. How much interest did your account earn? **\$334.03**
 - c. Including the value of the inheritance, how much was deposited? **\$3,400.00**
3. Relative to the curve representing your account balance at the end of each month, answer the following:
 - a. Describe the shape of the curve . **Curve is upwards (exponentially)**
 - b. Why is the curve this shape? **Interest is added to the principal plus the previously accumulated interest.**
 - c. How can you make it curve up faster? **Increase the interest rate.**
4. Relative to the curve representing the running total of the monthly deposits, answer the following:
 - a. Describe the shape of the curve. **Straight (linear)**
 - b. Why is the curve this shape? **A fixed amount is amount is added each month.**
 - c. How can you change the steepness of the curve? **Increase or decrease deposit amount.**
5. a. Enter the price of the vehicle you are planning to purchase. **Various**
b. Enter the value of your savings account after two years. **Various**
c. Enter account's surplus / deficit (difference between a & b). **Various**

6. a. Based on your account's surplus / deficit, what are your plans?

___ Buy the car

___ Buy a more expensive car -- price of car _____

___ Buy a cheaper car -- price of car _____

(Various answers.)

b. Do you need to get a loan? ___ yes ___ no If yes, specify loan amount. **Various**

7. a. Calculate the effective **Annual** Percentage Rate (APR). Hint: deposit 100 dollars and apply the monthly equivalent interest rate to the month ending balance to see what you end up with after one year.

5.12%

b. Why is this different from the annual interest rate you used?

The interest rate is compounded monthly.

8. Attach a printout of your spreadsheet -- one page showing the table with dollars and another sheet showing the formulas in each table cell. Ensure the information is neatly displayed and it is understandable.

(See Sample "Working for Wheels" in the Teacher's Guide.)

9. Attach a printout of your graph to this sheet. Be sure the graph has appropriate title, legend, and labels. Ensure the information is neatly displayed and it is understandable.

(See Sample "Working for Wheels" in the Teacher's Guide.)

WORKING FOR WHEELS

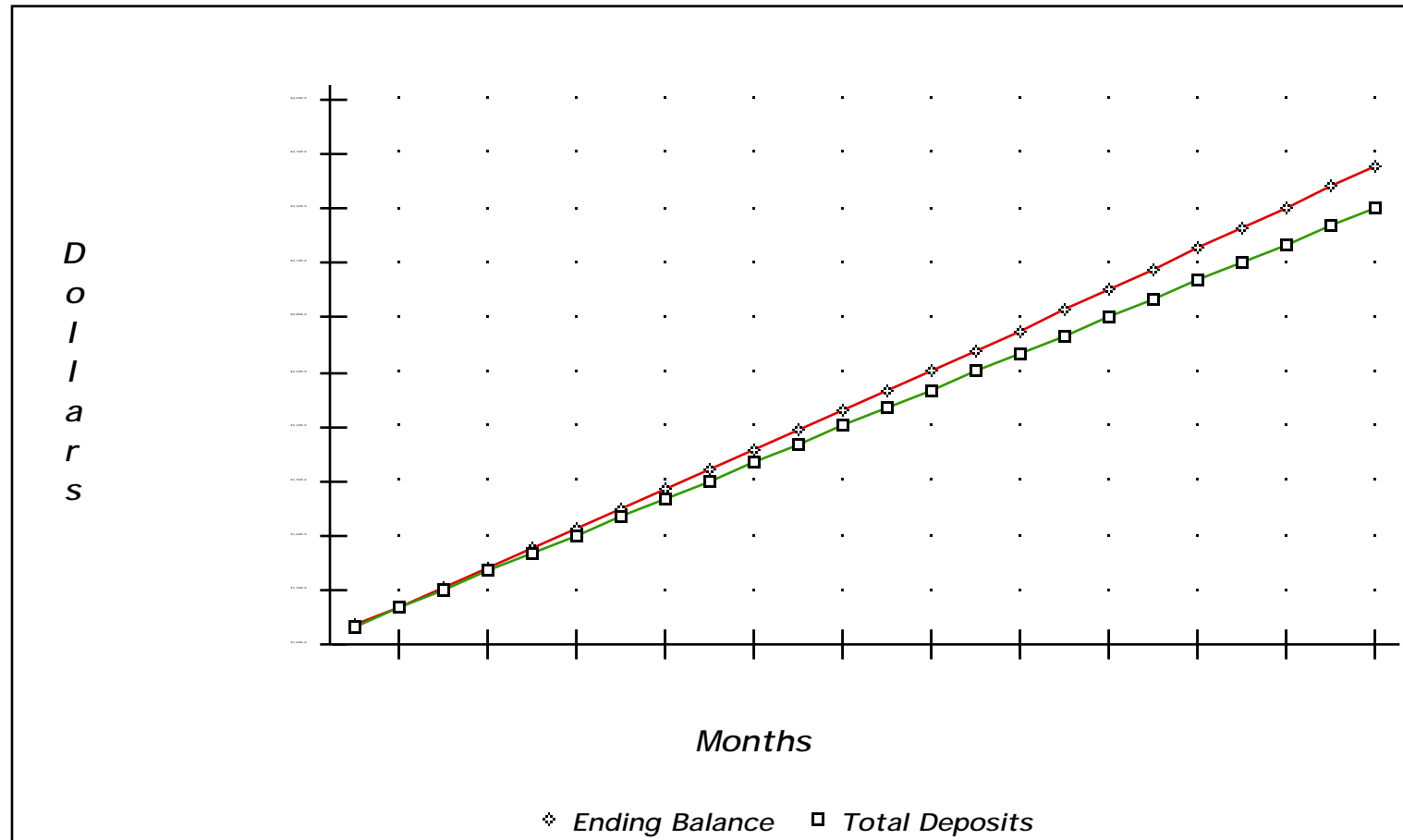
First Deposit	\$1000	Dollars			
Monthly Deposit	\$100	Dollars			
Interest Rate	5%	Annual Percentage			
Time	24	Months			
Months	Beginning Balance	Monthly Deposit	Interest	Ending Balance	Total Deposits
1	\$1000.00	\$100.00	\$4.58	\$1104.58	\$1100.00
2	\$1104.58	\$100.00	\$5.02	\$1209.60	\$1200.00
3	\$1209.60	\$100.00	\$5.46	\$1315.06	\$1300.00
4	\$1315.06	\$100.00	\$5.90	\$1420.96	\$1400.00
5	\$1420.96	\$100.00	\$6.34	\$1527.29	\$1500.00
6	\$1527.29	\$100.00	\$6.78	\$1634.07	\$1600.00
7	\$1634.07	\$100.00	\$7.23	\$1741.30	\$1700.00
8	\$1741.30	\$100.00	\$7.67	\$1848.97	\$1800.00
9	\$1848.97	\$100.00	\$8.12	\$1957.09	\$1900.00
10	\$1957.09	\$100.00	\$8.57	\$2065.66	\$2000.00
11	\$2065.66	\$100.00	\$9.02	\$2174.69	\$2100.00
12	\$2174.69	\$100.00	\$9.48	\$2284.16	\$2200.00
13	\$2284.16	\$100.00	\$9.93	\$2394.10	\$2300.00
14	\$2394.10	\$100.00	\$10.39	\$2504.49	\$2400.00
15	\$2504.49	\$100.00	\$10.85	\$2615.34	\$2500.00
16	\$2615.34	\$100.00	\$11.31	\$2726.66	\$2600.00
17	\$2726.66	\$100.00	\$11.78	\$2838.43	\$2700.00
18	\$2838.43	\$100.00	\$12.24	\$2950.68	\$2800.00
19	\$2950.68	\$100.00	\$12.71	\$3063.39	\$2900.00
20	\$3063.39	\$100.00	\$13.18	\$3176.57	\$3000.00
21	\$3176.57	\$100.00	\$13.65	\$3290.22	\$3100.00
22	\$3290.22	\$100.00	\$14.13	\$3404.35	\$3200.00
23	\$3404.35	\$100.00	\$14.60	\$3518.95	\$3300.00
24	\$3518.95	\$100.00	\$15.08	\$3634.03	\$3400.00

WORKING FOR WHEELS

First Deposit 1000 Dollars
 Monthly Deposit 100 Dollars
 Interest Rate .05 Annual Percentage
 Time 24 Months

Months	Beginning Balance	Monthly Deposit	Interest	Ending Balance	Total Deposits
1	=C3	=\$C\$4	=(C9+D9)*\$C\$5/12	=C9+D9+E9	=\$C\$3+D9
=A9+1	=F9	=\$C\$4	=(C10+D10)*\$C\$5/12	=C10+D10+E10	=G9+D10
=A10+1	=F10	=\$C\$4	=(C11+D11)*\$C\$5/12	=C11+D11+E11	=G10+D11
=A11+1	=F11	=\$C\$4	=(C12+D12)*\$C\$5/12	=C12+D12+E12	=G11+D12
=A12+1	=F12	=\$C\$4	=(C13+D13)*\$C\$5/12	=C13+D13+E13	=G12+D13
=A13+1	=F13	=\$C\$4	=(C14+D14)*\$C\$5/12	=C14+D14+E14	=G13+D14
=A14+1	=F14	=\$C\$4	=(C15+D15)*\$C\$5/12	=C15+D15+E15	=G14+D15
=A15+1	=F15	=\$C\$4	=(C16+D16)*\$C\$5/12	=C16+D16+E16	=G15+D16
=A16+1	=F16	=\$C\$4	=(C17+D17)*\$C\$5/12	=C17+D17+E17	=G16+D17
=A17+1	=F17	=\$C\$4	=(C18+D18)*\$C\$5/12	=C18+D18+E18	=G17+D18
=A18+1	=F18	=\$C\$4	=(C19+D19)*\$C\$5/12	=C19+D19+E19	=G18+D19
=A19+1	=F19	=\$C\$4	=(C20+D20)*\$C\$5/12	=C20+D20+E20	=G19+D20
=A20+1	=F20	=\$C\$4	=(C21+D21)*\$C\$5/12	=C21+D21+E21	=G20+D21
=A21+1	=F21	=\$C\$4	=(C22+D22)*\$C\$5/12	=C22+D22+E22	=G21+D22
=A22+1	=F22	=\$C\$4	=(C23+D23)*\$C\$5/12	=C23+D23+E23	=G22+D23
=A23+1	=F23	=\$C\$4	=(C24+D24)*\$C\$5/12	=C24+D24+E24	=G23+D24
=A24+1	=F24	=\$C\$4	=(C25+D25)*\$C\$5/12	=C25+D25+E25	=G24+D25
=A25+1	=F25	=\$C\$4	=(C26+D26)*\$C\$5/12	=C26+D26+E26	=G25+D26
=A26+1	=F26	=\$C\$4	=(C27+D27)*\$C\$5/12	=C27+D27+E27	=G26+D27
=A27+1	=F27	=\$C\$4	=(C28+D28)*\$C\$5/12	=C28+D28+E28	=G27+D28
=A28+1	=F28	=\$C\$4	=(C29+D29)*\$C\$5/12	=C29+D29+E29	=G28+D29
=A29+1	=F29	=\$C\$4	=(C30+D30)*\$C\$5/12	=C30+D30+E30	=G29+D30
=A30+1	=F30	=\$C\$4	=(C31+D31)*\$C\$5/12	=C31+D31+E31	=G30+D31
=A31+1	=F31	=\$C\$4	=(C32+D32)*\$C\$5/12	=C32+D32+E32	=G31+D32

WORKING FOR WHEELS



PERFORMANCE ASSESSMENT TASK

Can I Afford A Ferrari?

Problem Description

You have had money in the bank since you inherited \$1000 from your grandmother many years ago. You have been saving money from your part time job for the past several years. You have saved enough money to buy a used station wagon with fake woodgrain sides. However, you would like to buy a car that better fits your style. The problem is that you still do not have enough money to buy the car that you want. So you decide to follow the *American dream* the *American way* and take out a loan.

You will create a spreadsheet that calculates car payments based on variable inputs of: **loan amount, interest rate**, and desired **monthly payment**. You will use the spreadsheet to answer questions and determine the affordability of buying various types of cars, including your dream car.

Task

Create a spreadsheet for 48 months that calculates the affordability of taking out various loan amounts. In addition, create a graph from the spreadsheet for data interpretation. See the performance assessment instruction sheet. Start with a loan of \$10,000 for 48 months at 12% interest, with a \$250 monthly payment.

Questions

1. At the end of 48 months, what is the balance of the \$10,000 loan? **\$1,990.33**
2. Will you be able to buy the car in 48 months at the current level of monthly payments? Continue to change the monthly payment amount to determine what the monthly payments would need to be in order for the balance to be 0 at the end of 48 months? **\$287.27**
3. Name three changes that you could make in order to be able to pay off the loan.
 - a. **Borrow less**
 - b. **Higher monthly payment**
 - c. **Lower interest rate**
4. What is the maximum amount that you could borrow at 12% with a \$250 monthly payment and pay off in 48 months? **\$8,700**
5. What would the interest rate have to be to pay off a \$10,000 loan with \$250 monthly payments? **4%**
6. Graph the interest and principal amounts vs. time. Explain the relationship over time.
Interest amount decreases and principal amount increases.
7. Using the graph, how would you interpret the relationship between total principal, total interest and total payment? In what month will the loan be 50% paid off?
Total Interest + Total Principal = Total Payment

Extension

Determine the set of conditions (payment, interest rate and principal) under which you can purchase the car that you selected in your homework assignment.

Student answers will vary.

Putting Your Money to Work

Written Performance Assessment

You have completed several activities in which you have built spreadsheets and used graphs to analyze the effects of investing money. In this assessment, you will recall some of the information that you have learned and apply that knowledge to build a spreadsheet and graph to analyze payments for a purchase.

1. Explain the difference between a relative and an absolute reference.

When a relative reference is copied from one cell to another, the new cell will contain a new cell address that is in a relative position.

2. What is an algorithm? **An algorithm is a rule or model for solving a problem.**

3. What makes this model different from a calculation? **Answers will vary**

4. Define the following terms as they apply to an investment or a loan:

a. Principal **The amount of money invested or borrowed**

b. Investment Period **The time money is invested**

c. Loan Payment Period **Period of time for loan to be repaid**

d. Interest Rate **The fee paid for the use of money, expressed in annual terms**

e. Total Value of Investment **Principal + Principal * Interest**

f. Total Loan Payment **Principal + Interest**

5. Complete the word equation:

Total Value of Investment = **Principal + (Principal * Interest)**

6. Complete the word equation:

Total Loan Payment = **Principal + Interest**

7. You recently bought a stereo system and still owe \$1,200 on the outstanding loan. Yesterday, you won \$2,000 in a science fair contest. You have the option to payoff all, some or none of your loan balance. You have chosen to invest the amount not applied to the loan. Given what you have learned through your spreadsheet analyses, explain what you would choose to do with your money and why.

Pay the loan off because loan interest is usually higher than investment interest.

CAN I AFFORD A FERRARI ?

CAR LOAN \$10000
 INTEREST RATE 9%
 MONTHLY PAYMENT \$248.85

MONTH	BALANCE	TOTAL PRINCIPAL	TOTAL PAYMENT	TOTAL INTEREST	INTEREST	PRINCIPAL	NEW BALANCE
1	\$10000.00	\$173.85	\$248.85	\$75.00	\$75.00	\$173.85	\$9826.15
2	\$9826.15	\$347.70	\$497.70	\$148.70	\$73.70	\$175.15	\$9651.00
3	\$9651.00	\$522.86	\$746.55	\$221.08	\$72.38	\$176.47	\$9474.53
4	\$9474.53	\$699.32	\$995.40	\$292.14	\$71.06	\$177.79	\$9296.74
5	\$9296.74	\$877.11	\$1244.25	\$361.86	\$69.73	\$179.12	\$9117.61
6	\$9117.61	\$1056.24	\$1493.10	\$430.25	\$68.38	\$180.47	\$8937.14
7	\$8937.14	\$1236.71	\$1741.95	\$497.27	\$67.03	\$181.82	\$8755.32
8	\$8755.32	\$1418.53	\$1990.80	\$562.94	\$65.66	\$183.19	\$8572.14
9	\$8572.14	\$1601.71	\$2239.65	\$627.23	\$64.29	\$184.56	\$8387.58
10	\$8387.58	\$1786.27	\$2488.50	\$690.14	\$62.91	\$185.94	\$8201.63
11	\$8201.63	\$1972.22	\$2737.35	\$751.65	\$61.51	\$187.34	\$8014.29
12	\$8014.29	\$2159.56	\$2986.20	\$811.76	\$60.11	\$188.74	\$7825.55
13	\$7825.55	\$2348.30	\$3235.06	\$870.45	\$58.69	\$190.16	\$7635.39
14	\$7635.39	\$2538.46	\$3483.91	\$927.71	\$57.27	\$191.58	\$7443.81
15	\$7443.81	\$2730.04	\$3732.76	\$983.54	\$55.83	\$193.02	\$7250.79
16	\$7250.79	\$2923.06	\$3981.61	\$1037.92	\$54.38	\$194.47	\$7056.32
17	\$7056.32	\$3117.53	\$4230.46	\$1090.84	\$52.92	\$195.93	\$6860.39
18	\$6860.39	\$3313.46	\$4479.31	\$1142.30	\$51.45	\$197.40	\$6662.99
19	\$6662.99	\$3510.86	\$4728.16	\$1192.27	\$49.97	\$198.88	\$6464.11
20	\$6464.11	\$3709.74	\$4977.01	\$1240.75	\$48.48	\$200.37	\$6263.74
21	\$6263.74	\$3910.11	\$5225.86	\$1287.73	\$46.98	\$201.87	\$6061.87
22	\$6061.87	\$4111.98	\$5474.71	\$1333.19	\$45.46	\$203.39	\$5858.48
23	\$5858.48	\$4315.37	\$5723.56	\$1377.13	\$43.94	\$204.91	\$5653.57
24	\$5653.57	\$4520.28	\$5972.41	\$1419.53	\$42.40	\$206.45	\$5447.12
25	\$5447.12	\$4726.73	\$6221.26	\$1460.39	\$40.85	\$208.00	\$5239.13
26	\$5239.13	\$4934.72	\$6470.11	\$1499.68	\$39.29	\$209.56	\$5029.57
27	\$5029.57	\$5144.28	\$6718.96	\$1537.40	\$37.72	\$211.13	\$4818.44
28	\$4818.44	\$5355.41	\$6967.81	\$1573.54	\$36.14	\$212.71	\$4605.73

CAN I AFFORD A FERRARI ?

29	\$4605.73	\$5568.12	\$7216.66	\$1608.08	\$34.54	\$214.31	\$4391.42
30	\$4391.42	\$5782.43	\$7465.51	\$1641.02	\$32.94	\$215.91	\$4175.51
31	\$4175.51	\$5998.34	\$7714.36	\$1672.34	\$31.32	\$217.53	\$3957.97
32	\$3957.97	\$6215.88	\$7963.21	\$1702.02	\$29.68	\$219.17	\$3738.81
33	\$3738.81	\$6435.04	\$8212.06	\$1730.06	\$28.04	\$220.81	\$3518.00
34	\$3518.00	\$6655.85	\$8460.91	\$1756.45	\$26.38	\$222.47	\$3295.53
35	\$3295.53	\$6878.32	\$8709.76	\$1781.16	\$24.72	\$224.13	\$3071.40
36	\$3071.40	\$7102.45	\$8958.61	\$1804.20	\$23.04	\$225.81	\$2845.58
37	\$2845.58	\$7328.27	\$9207.46	\$1825.54	\$21.34	\$227.51	\$2618.08
38	\$2618.08	\$7555.78	\$9456.32	\$1845.18	\$19.64	\$229.21	\$2388.86
39	\$2388.86	\$7784.99	\$9705.17	\$1863.09	\$17.92	\$230.93	\$2157.93
40	\$2157.93	\$8015.92	\$9954.02	\$1879.28	\$16.18	\$232.67	\$1925.26
41	\$1925.26	\$8248.59	\$10202.87	\$1893.72	\$14.44	\$234.41	\$1690.85
42	\$1690.85	\$8483.00	\$10451.72	\$1906.40	\$12.68	\$236.17	\$1454.68
43	\$1454.68	\$8719.17	\$10700.57	\$1917.31	\$10.91	\$237.94	\$1216.74
44	\$1216.74	\$8957.11	\$10949.42	\$1926.43	\$9.13	\$239.72	\$977.02
45	\$977.02	\$9196.83	\$11198.27	\$1933.76	\$7.33	\$241.52	\$735.49
46	\$735.49	\$9438.36	\$11447.12	\$1939.28	\$5.52	\$243.33	\$492.16
47	\$492.16	\$9681.69	\$11695.97	\$1942.97	\$3.69	\$245.16	\$247.00
48	\$247.00	\$9926.85	\$11944.82	\$1944.82	\$1.85	\$247.00	\$0.00

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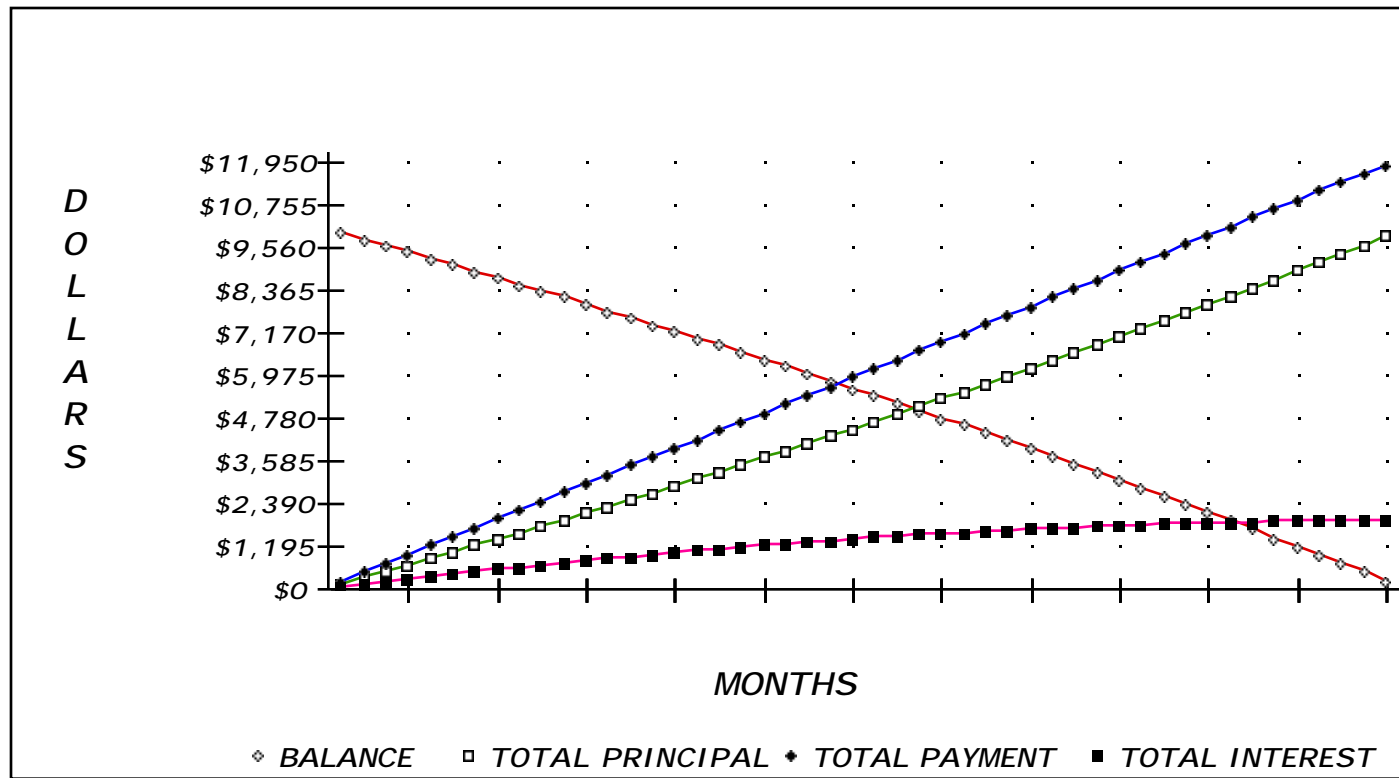
CAR LOAN 10000
 INTEREST RATE .09
 MONTHLY PAYMENT 248.8504

MONTH	BALANCE	TOTAL PRINCIPAL	TOTAL PAYMENT	TOTAL INTEREST	INTEREST	PRINCIPAL	NEW BALANCE
1	=C\$1	=G6	=F6+G6	=F6	=B6*\$C\$2/12	=C\$3-F6	=B6-G6
=A6+1	=H6	=G6+G6	=D6+F6+G6	=E6+F7	=B7*\$C\$2/12	=C\$3-F7	=B7-G7
=A7+1	=H7	=C7+G7	=D7+F7+G7	=E7+F8	=B8*\$C\$2/12	=C\$3-F8	=B8-G8
=A8+1	=H8	=C8+G8	=D8+F8+G8	=E8+F9	=B9*\$C\$2/12	=C\$3-F9	=B9-G9
=A9+1	=H9	=C9+G9	=D9+F9+G9	=E9+F10	=B10*\$C\$2/12	=C\$3-F10	=B10-G10
=A10+1	=H10	=C10+G10	=D10+F10+G10	=E10+F11	=B11*\$C\$2/12	=C\$3-F11	=B11-G11
=A11+1	=H11	=C11+G11	=D11+F11+G11	=E11+F12	=B12*\$C\$2/12	=C\$3-F12	=B12-G12
=A12+1	=H12	=C12+G12	=D12+F12+G12	=E12+F13	=B13*\$C\$2/12	=C\$3-F13	=B13-G13
=A13+1	=H13	=C13+G13	=D13+F13+G13	=E13+F14	=B14*\$C\$2/12	=C\$3-F14	=B14-G14
=A14+1	=H14	=C14+G14	=D14+F14+G14	=E14+F15	=B15*\$C\$2/12	=C\$3-F15	=B15-G15
=A15+1	=H15	=C15+G15	=D15+F15+G15	=E15+F16	=B16*\$C\$2/12	=C\$3-F16	=B16-G16
=A16+1	=H16	=C16+G16	=D16+F16+G16	=E16+F17	=B17*\$C\$2/12	=C\$3-F17	=B17-G17
=A17+1	=H17	=C17+G17	=D17+F17+G17	=E17+F18	=B18*\$C\$2/12	=C\$3-F18	=B18-G18
=A18+1	=H18	=C18+G18	=D18+F18+G18	=E18+F19	=B19*\$C\$2/12	=C\$3-F19	=B19-G19
=A19+1	=H19	=C19+G19	=D19+F19+G19	=E19+F20	=B20*\$C\$2/12	=C\$3-F20	=B20-G20
=A20+1	=H20	=C20+G20	=D20+F20+G20	=E20+F21	=B21*\$C\$2/12	=C\$3-F21	=B21-G21
=A21+1	=H21	=C21+G21	=D21+F21+G21	=E21+F22	=B22*\$C\$2/12	=C\$3-F22	=B22-G22
=A22+1	=H22	=C22+G22	=D22+F22+G22	=E22+F23	=B23*\$C\$2/12	=C\$3-F23	=B23-G23
=A23+1	=H23	=C23+G23	=D23+F23+G23	=E23+F24	=B24*\$C\$2/12	=C\$3-F24	=B24-G24
=A24+1	=H24	=C24+G24	=D24+F24+G24	=E24+F25	=B25*\$C\$2/12	=C\$3-F25	=B25-G25
=A25+1	=H25	=C25+G25	=D25+F25+G25	=E25+F26	=B26*\$C\$2/12	=C\$3-F26	=B26-G26
=A26+1	=H26	=C26+G26	=D26+F26+G26	=E26+F27	=B27*\$C\$2/12	=C\$3-F27	=B27-G27
=A27+1	=H27	=C27+G27	=D27+F27+G27	=E27+F28	=B28*\$C\$2/12	=C\$3-F28	=B28-G28
=A28+1	=H28	=C28+G28	=D28+F28+G28	=E28+F29	=B29*\$C\$2/12	=C\$3-F29	=B29-G29
=A29+1	=H29	=C29+G29	=D29+F29+G29	=E29+F30	=B30*\$C\$2/12	=C\$3-F30	=B30-G30
=A30+1	=H30	=C30+G30	=D30+F30+G30	=E30+F31	=B31*\$C\$2/12	=C\$3-F31	=B31-G31
=A31+1	=H31	=C31+G31	=D31+F31+G31	=E31+F32	=B32*\$C\$2/12	=C\$3-F32	=B32-G32
=A32+1	=H32	=C32+G32	=D32+F32+G32	=E32+F33	=B33*\$C\$2/12	=C\$3-F33	=B33-G33

CAN I AFFORD A FERRARI ?

=A33+1	=H33	=C33+G33	=D33+F33+G33	=E33+F34	=B34*\$C\$2/12	=C\$3-F34	=B34-G34
=A34+1	=H34	=C34+G34	=D34+F34+G34	=E34+F35	=B35*\$C\$2/12	=C\$3-F35	=B35-G35
=A35+1	=H35	=C35+G35	=D35+F35+G35	=E35+F36	=B36*\$C\$2/12	=C\$3-F36	=B36-G36
=A36+1	=H36	=C36+G36	=D36+F36+G36	=E36+F37	=B37*\$C\$2/12	=C\$3-F37	=B37-G37
=A37+1	=H37	=C37+G37	=D37+F37+G37	=E37+F38	=B38*\$C\$2/12	=C\$3-F38	=B38-G38
=A38+1	=H38	=C38+G38	=D38+F38+G38	=E38+F39	=B39*\$C\$2/12	=C\$3-F39	=B39-G39
=A39+1	=H39	=C39+G39	=D39+F39+G39	=E39+F40	=B40*\$C\$2/12	=C\$3-F40	=B40-G40
=A40+1	=H40	=C40+G40	=D40+F40+G40	=E40+F41	=B41*\$C\$2/12	=C\$3-F41	=B41-G41
=A41+1	=H41	=C41+G41	=D41+F41+G41	=E41+F42	=B42*\$C\$2/12	=C\$3-F42	=B42-G42
=A42+1	=H42	=C42+G42	=D42+F42+G42	=E42+F43	=B43*\$C\$2/12	=C\$3-F43	=B43-G43
=A43+1	=H43	=C43+G43	=D43+F43+G43	=E43+F44	=B44*\$C\$2/12	=C\$3-F44	=B44-G44
=A44+1	=H44	=C44+G44	=D44+F44+G44	=E44+F45	=B45*\$C\$2/12	=C\$3-F45	=B45-G45
=A45+1	=H45	=C45+G45	=D45+F45+G45	=E45+F46	=B46*\$C\$2/12	=C\$3-F46	=B46-G46
=A46+1	=H46	=C46+G46	=D46+F46+G46	=E46+F47	=B47*\$C\$2/12	=C\$3-F47	=B47-G47
=A47+1	=H47	=C47+G47	=D47+F47+G47	=E47+F48	=B48*\$C\$2/12	=C\$3-F48	=B48-G48
=A48+1	=H48	=C48+G48	=D48+F48+G48	=E48+F49	=B49*\$C\$2/12	=C\$3-F49	=B49-G49
=A49+1	=H49	=C49+G49	=D49+F49+G49	=E49+F50	=B50*\$C\$2/12	=C\$3-F50	=B50-G50
=A50+1	=H50	=C50+G50	=D50+F50+G50	=E50+F51	=B51*\$C\$2/12	=C\$3-F51	=B51-G51
=A51+1	=H51	=C51+G51	=D51+F51+G51	=E51+F52	=B52*\$C\$2/12	=C\$3-F52	=B52-G52
=A52+1	=H52	=C52+G52	=D52+F52+G52	=E52+F53	=B53*\$C\$2/12	=C\$3-F53	=B53-G53

CAN I AFFORD A FERRARI ?



Spreadsheet Rubric
SIMT Computational Science
Draft
6/24/98

critrion	achieved	making progress	not met	points
Spreadsheet				
• Mathematical representation	formulas correctly used; values correctly referenced; algorithms appropriate; results valid	some errors in formulas, references and algorithms that lead to invalid results	major errors in numerical formulas	-----
• spreadsheet mechanics	evidence of and correct use of text, numbers, formulas, and references; functions correctly used; efficient layout and design	some errors in use of text, numbers, formulas or references	incorrect use of functions, tools, or references	-----
• presentation	numbers appropriately formatted; labels, units and titles included; visually appealing; correct spelling and grammar	titles, labels or units missing OR major flaws that do not affect the function of the spreadsheet	poor choice of layout that makes the data and calculations hard to read	-----
Graphs				
• Visual representation	graph is appropriate for data		inappropriate choice of graph	-----
• Numerical input	appropriate selection of data subset; scales appropriate; multi-set data correctly selected	incomplete selection of data sets OR poor choice of scaling factors	inappropriate selection of data to graph	-----
• presentation	visually appealing; appropriate use of labels, titles, and legends; spelling and grammar correct		labels, legends and titles missing, making the graph hard to interpret	-----